Allowing for the orienting response in GSR conditioning¹

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In an experiment designed to partial out the orienting response, 16 college students observed a series of lights of four colors. These lights were presented one at a time in random order. There were 120 stimulus presentations, each lasting 7.5 sec. As there was no interstimulus interval, the duration of the procedure was exactly 15 min. Pairing of a mild electric shock with the critical signal (amber light) occurred only during the middle third of the experiment, thus enabling a direct comparison of the responses before and after conditioning. The GSR recordings showed conditioning to be highly significant ($p < .001$).

One of the most recurrent questions in GSR conditioning concerns the adaptation procedures used to guard against the ubiquitous orienting response. The Russians, in particular (e.g., Voronin, Leontiev, Luria, Sokolov, & Vinogradova, 1965) have devoted a great deal of attention to this area. In this country, Hilgard & Marquis (1940) cautioned against the dangers of pseudoconditioning and sensitization almost three decades ago. More recently, others (such as Stewart, Stern, Winokur, & Fredman, 1961) have charged that previous investigators failed to demonstrate uncontaminated conditioning of the GSR. Korn & Welch (1962) added their own criticisms to those already levied, but then went on to introduce a new adaptation procedure which they regarded as unique and strikingly superior. Their approach was to embed the CS in a matrix of similar stimuli, thus resulting in adaptation which was both quicker and more reliable than that achieved by conventional methods. They maintained that the rhythmic stimulus pattern had produced some hypnoticlike effects, thus damping any irrelevant responses, yet at the same time leading to a sustained level of orientation.

The purpose of the present study is to evaluate the effectiveness of the Korn and Welch procedure in an actual conditioning paradigm. Their experiment was replicated, except for the addition of a mild electric shock in association with the signal they had arbitrarily designated as the "critical stimulus." The hypothesis was that it would now be possible to arrive at a truer estimate of the magnitude of the CR.

METHOD

Subjects

The Ss were 16 students (6 male and 10 female), ranging in age from 17 to 22 years and were paid volunteers. Each S was run individually in a session lasting 15 min.

Apparatus

GSR readings were accomplished with a Lafayette 7603 2A Model C recorder equipped with finger electrodes. The Ss were seated individually in a completely darkened room about 5 ft in front of a panel with a 1.5 in. ground glass aperture at its center. The ground glass was backlit by bulbs of four different colors. The colors—red, blue, white, and amber—were presented for $7.5 \pm .01$ sec in random order and without any intervening interval. Timing of the sequence was achieved with a modified Hunter timing device which tripped a 40-position stepping relay.

Procedure

Dark adaptation was allowed to proceed for about 5 min before actual testing began. During the second of three revolutions of the stepping relay, the color chosen as the CS (amber) was coupled with a mild electric shock each time it was presented. The shock was automatically triggered by the

Hunter timer 0.5 ($\pm .01$) sec after the onset of the amber light. Shock was not administered during the first or third revolutions so that a direct before-after comparison might be made. Responses were scored by comparing the S's resistance level, in ohms, immediately prior to the onset of the signal light with the peak resistance decrease during the 7.5-sec exposure of the light. The response equaled the decrease in resistance divided by the prestimulation resistance. This was multiplied by 100 to yield a per cent change.

Instructions

The Ss were aware of the fact that they were to be shocked when they agreed to participate in the experiment. Their only instructions were to pay attention to the series of colored lights as they were presented. They were informed that their GSR was being recorded, and that shock would be associated in some manner with the lights.

RESULTS

A direct before-after comparison of the responses to each of the colored signal lights reveals the dramatic results shown in Fig. 1. The differences in magnitude of response to the four colors prior to the association of shock with the amber light are not significant. Furthermore, the before-after differences for the buffer stimuli do not reach statistical significance, although there does seem to be a general trend toward a lesser degree of responsiveness. In marked contrast to the other three colors, the amber light elicits a sharp increase in the magnitude of response following the conditioning trials ($p < .001$). Obviously there has been conditioning above and beyond the orienting response. The average response to the three non-critical lights has fallen below 3% in each case, whereas the average decrease in skin resistance to the amber light approaches 16%. Thus it would appear that the 13% difference in favor of the amber light can only be attributed to the interpolated conditioning trials.

Fig. 1. Average magnitude of GSR response (all Ss) to each of the presentations of the colored signal lights before and after conditioning.

Table 1
Average Responses to the Colors Following Conditioning

S	Blue	White	Amber	Red	S	Blue	White	Amber	Red
1	4.3	4.7	17.4	1.2	9	0.2	1.4	14.1	1.7
2	9.1	10.7	23.0	12.1	10	0.0	0.0	24.0	0.1
3	5.4	0.3	8.4	3.3	11	3.5	3.8	10.9	2.9
4	1.5	0.1	15.1	0.8	12	0.6	1.3	13.1	0.9
5	1.8	2.3	18.8	0.1	13	0.3	1.0	6.1	0.2
6	3.5	5.7	23.2	6.1	14	3.0	2.5	10.1	2.6
7	0.6	1.6	4.4	0.2	15	1.1	1.3	25.2	0.5
8	16.5	22.0	22.7	18.3	16	0.0	0.0	0.0	0.0
All Ss						2.3	2.8	15.8 ^a	2.3 ^b

Note—All values represent percentage decrease in skin resistance.

^a $t = 15.80, p < .001$

^bThe comparable averages prior to conditioning for all Ss are as follows: Blue: 4.7, White: 5.4, Amber: 4.8, and Red: 3.2

DISCUSSION

The Korn and Welch technique of adaptation as employed in the present experiment can be seen to be effective in separating the effects of the orienting response from those of the true CR. While it seems to be impossible to eliminate the orienting response entirely, it is not difficult to keep it constant and to thereby obtain an uninflated estimate of conditioning. The Korn and Welch procedure should, however, be used with caution. In prolonged testing sessions, such as those undertaken in a pilot study in our laboratory, the extreme repetitiveness of the situation tends to depress any CR to the extent that it may become completely lost.

The Korn and Welch method certainly is worthy of further investigation as a procedural tool. In compensating for the orienting response, it has achieved its primary objective. Yet the question remains as to whether other more directly practical applications can be found. Future research is indicated in order to determine the effects of a partial reinforcement schedule using this paradigm. Also worthy of attention would be a cross-modal autonomic conditioning experiment undertaken along these lines. The authors are presently engaged in such a study, replicating what has previously been described, but now with the concurrent conditioning of the pupillary reflex. Hopefully, this will result in a revealing comparison of the two autonomic measures.

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